



# Use of Prenatal Care and its Impact on Healthy Births

Team 20 - Ariane Erickson, Daniella Furman, Yerin Lim,  
Kelsey Maass, Vi Nguyen, Jialing Wang, Sophia Yang

# Team 20



Ariane Erickson



Daniella Furman



Hana Lim



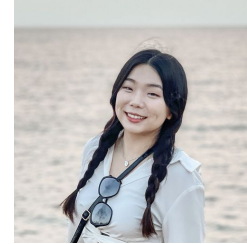
Kelsey Maass



Vi Nguyen



Jialing Wang



Sophia Yang

Thank you to Wen-Ying and Anastasia for your guidance!

# Agenda

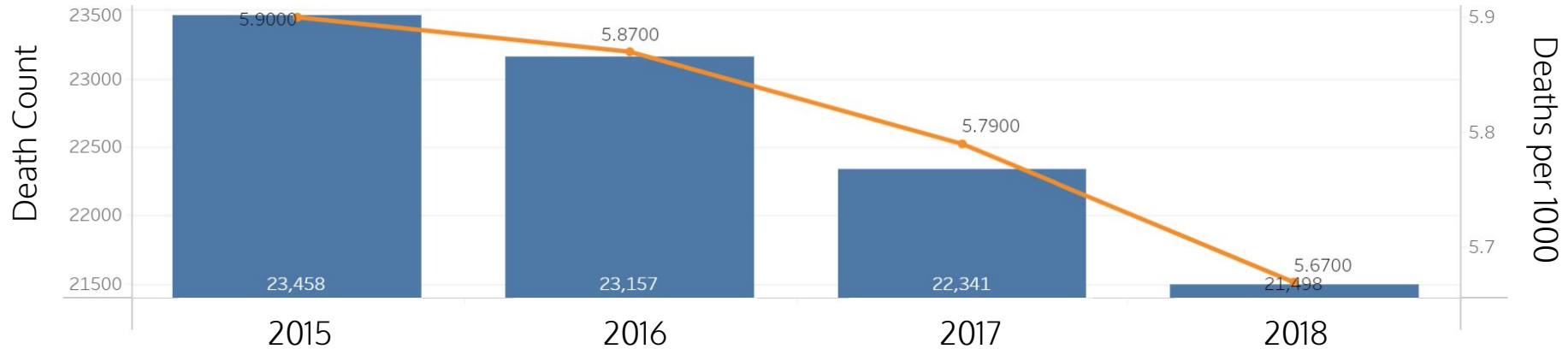
- Introduction
- Dashboards
- Statistical Analysis
- Conclusions



# Introduction

# Birth Outcomes in the U.S.

Despite recent downward trends in infant mortality rate, the U.S. ranks 33 out of 36 with respect to infant mortality in comparable countries (OECD).



# Why does the United States Have High Rates of Infant Morbidity and Mortality?

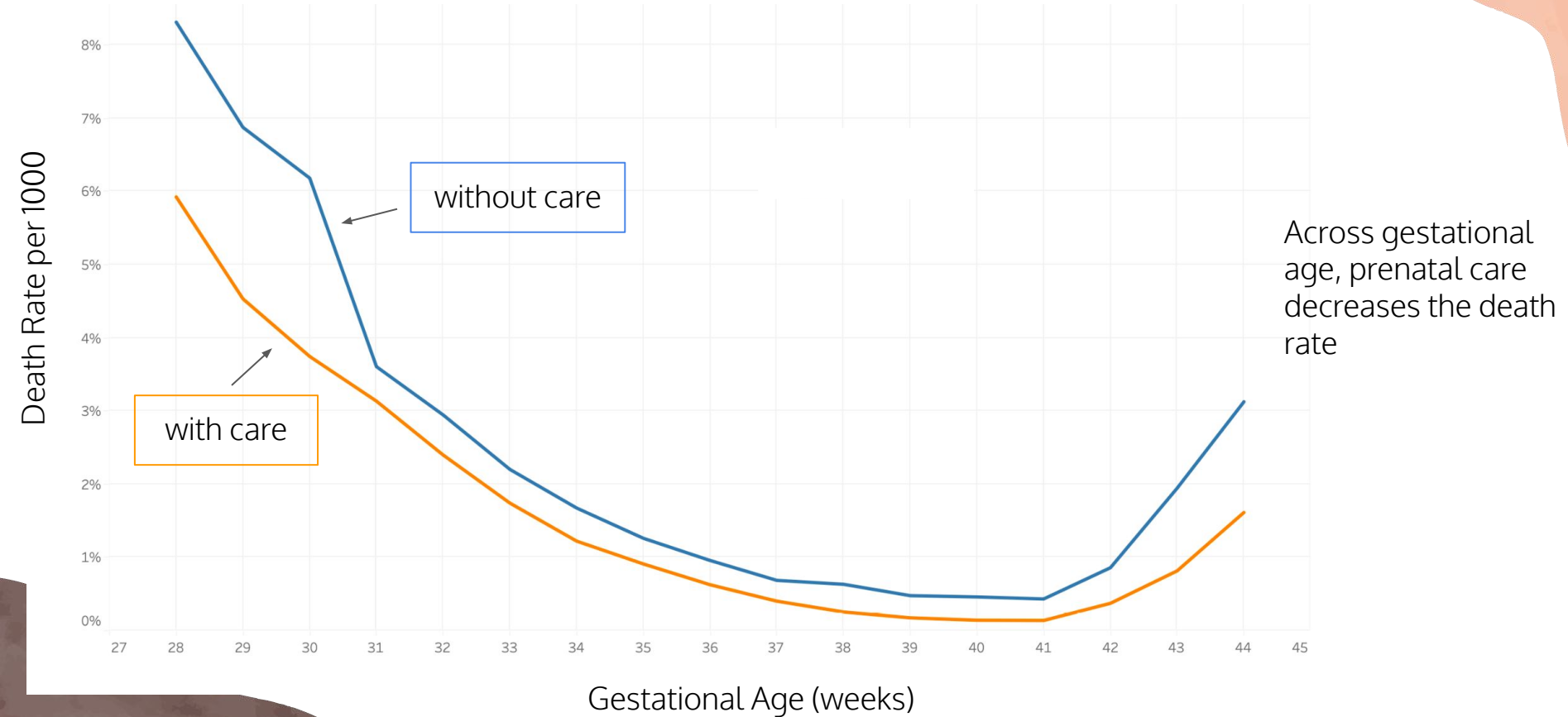
## Key Factors Investigated:

- Demographics of Mother
  - Ethnicity
  - Race
  - Socioeconomic Status
  - Level of Education
  - WIC Recipient
  - Nativity (in or outside US)
- Medical Care
  - Use of Prenatal Care
  - Trimester Prenatal Care Started
  - Payment Source for Delivery
- Infant Birth Characteristics
  - NICU Stay
  - APGAR Score (birth weight)
  - Gestational Age at Birth

# Honing in on Prenatal Care

1. What factors influence who receives prenatal care?
2. How does prenatal care affect birth outcomes?

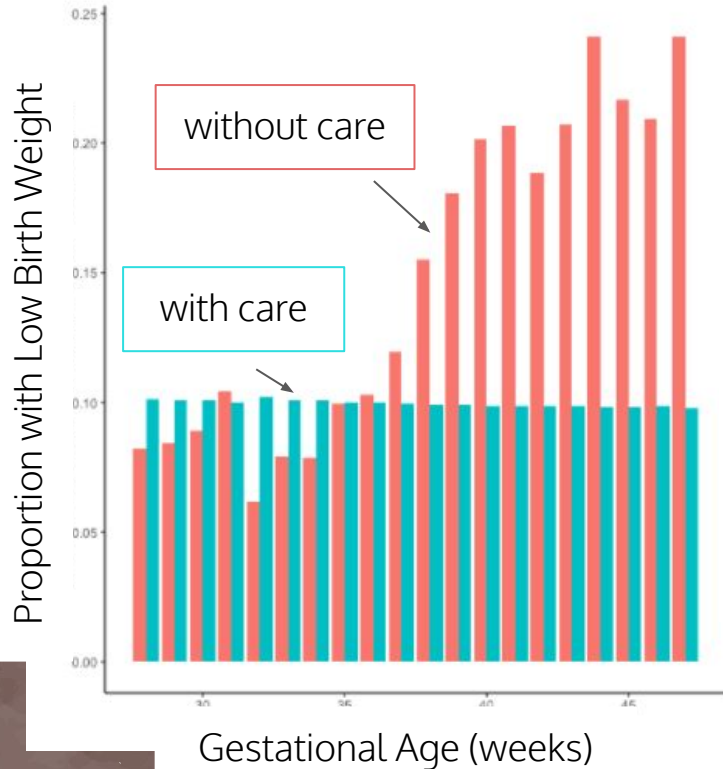
# Prenatal Care in the US



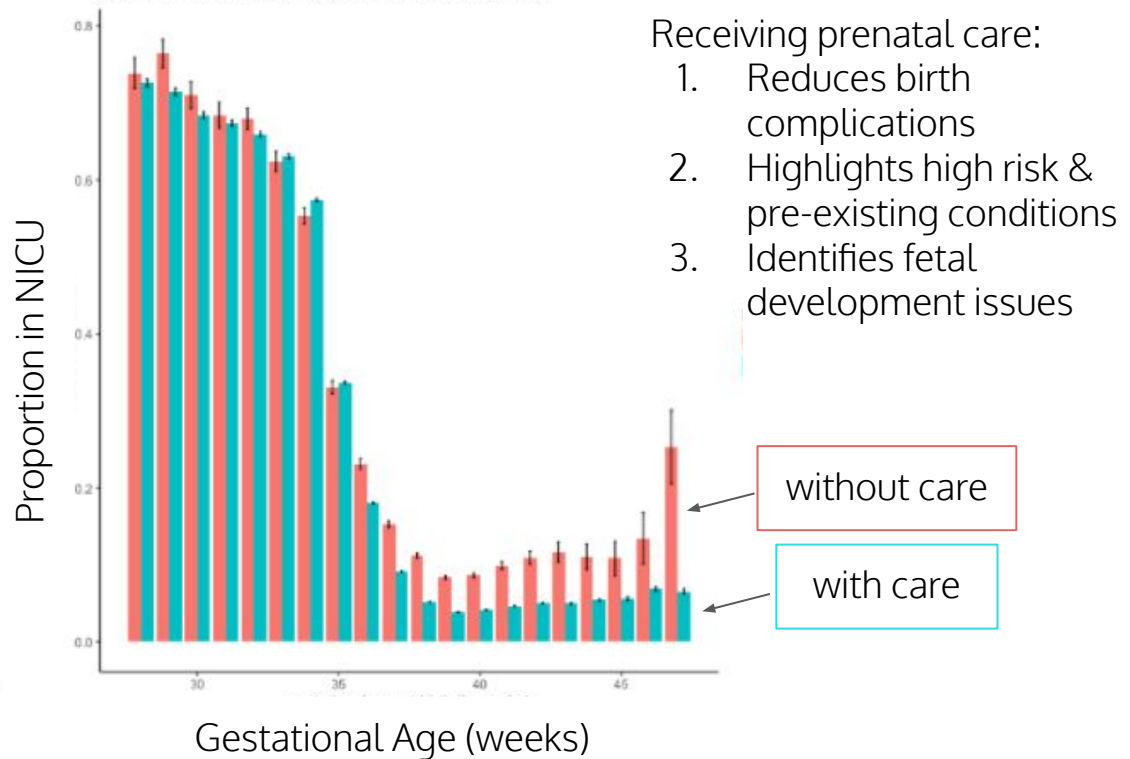


# Prenatal Care's Role in Infant Outcomes

## Decreased Risk of Low Birth Weight



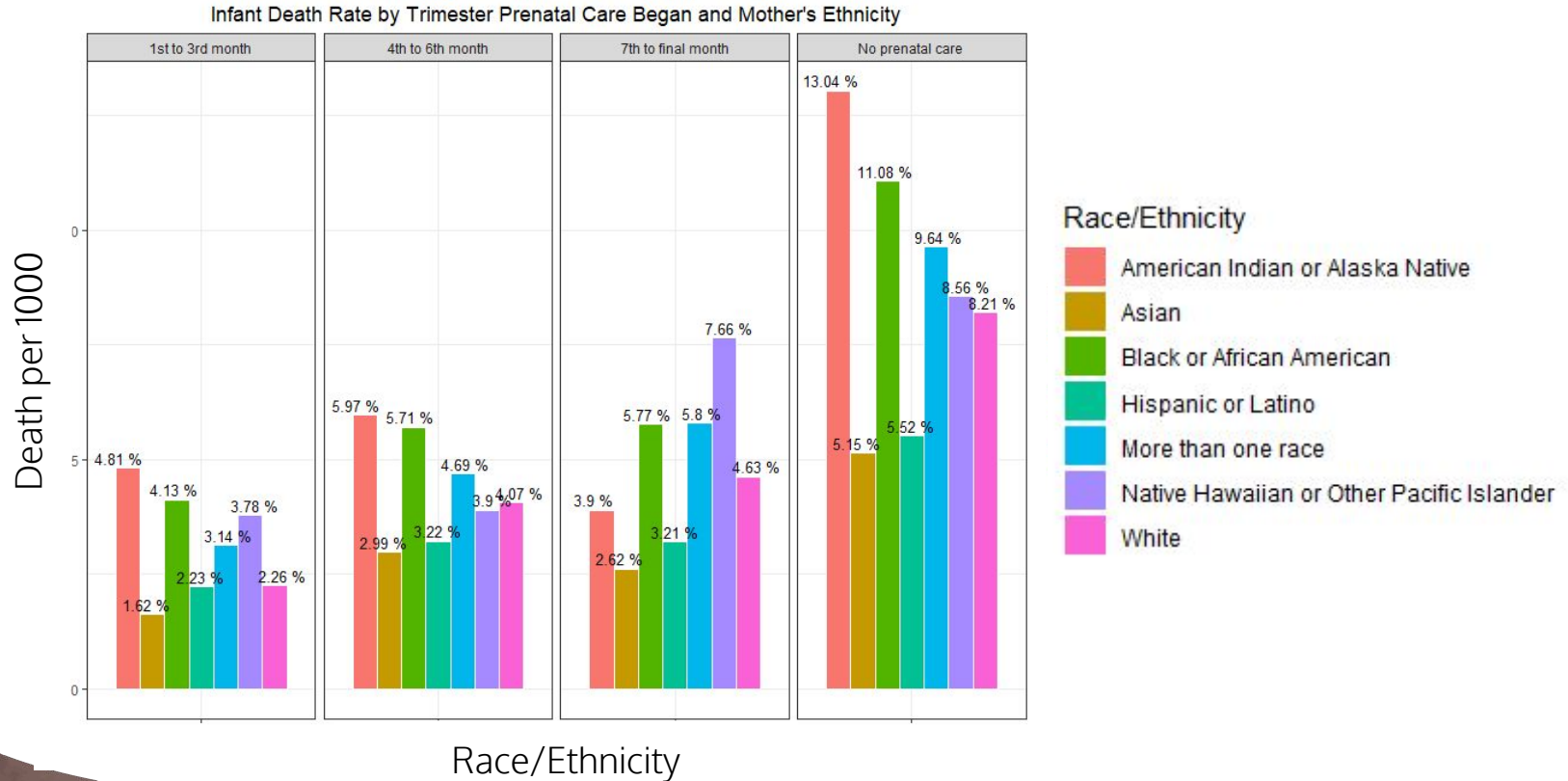
## Decreased Risk of NICU Stay



Receiving prenatal care:

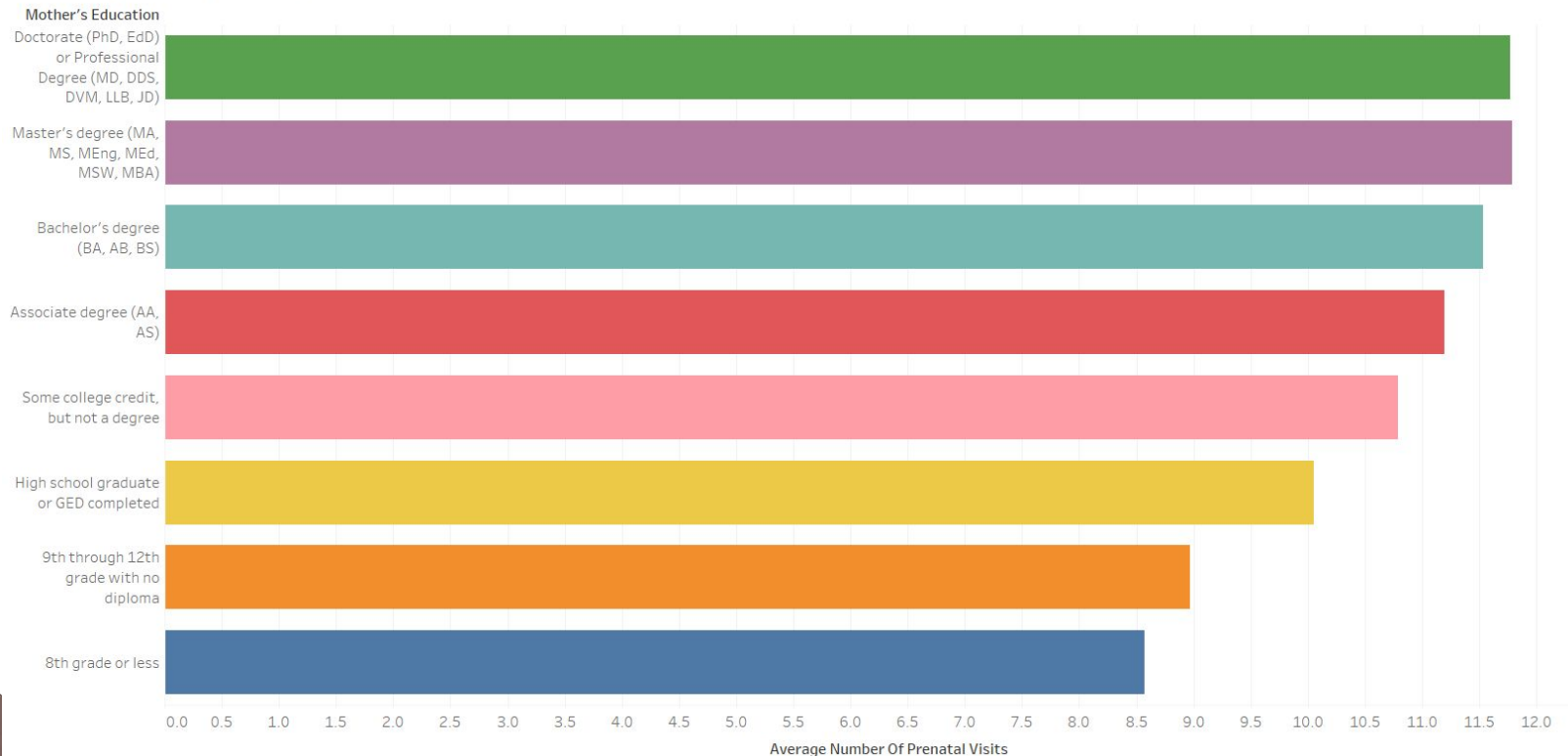
1. Reduces birth complications
2. Highlights high risk & pre-existing conditions
3. Identifies fetal development issues

# Prenatal Care and Race/Ethnicity of Mother



# Mother's Education and Number of Prenatal Visits

Mother's Education vs Avg Prenatal Visits

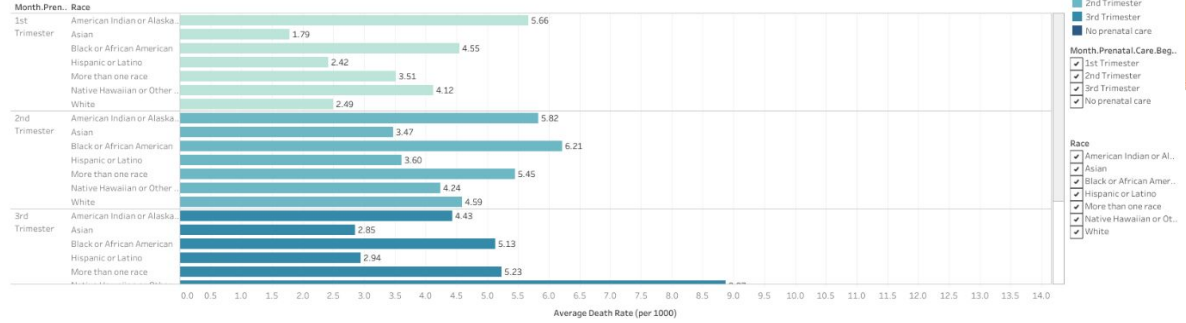




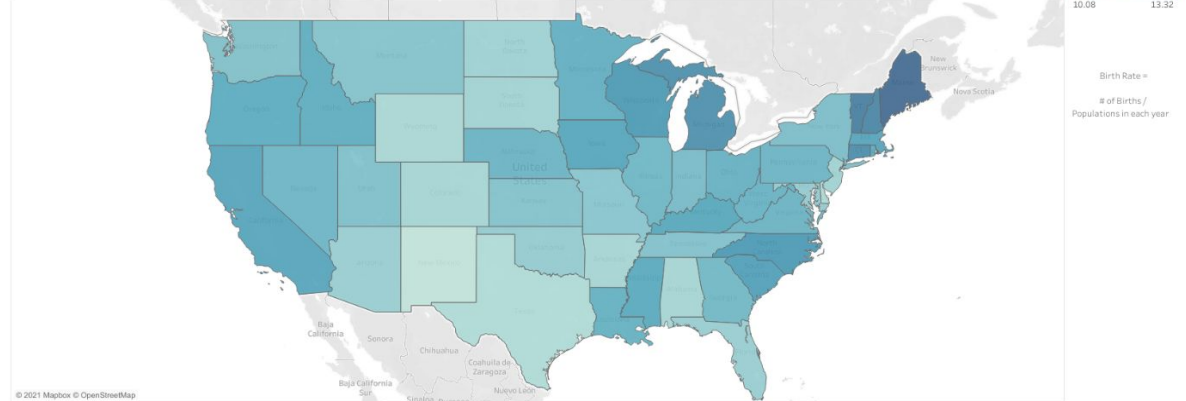
# Tableau Dashboards

# Dashboard 1 - Prenatal Care [Interactive dashboard]

Death Rate Per 1000 (click on the - sign of Month Prenatal Care Begin look at trimester level)



Prenatal Statistics by States



Top N States with highest Death Rate (per 1000)



Top N States with highest Prenatal Visits number



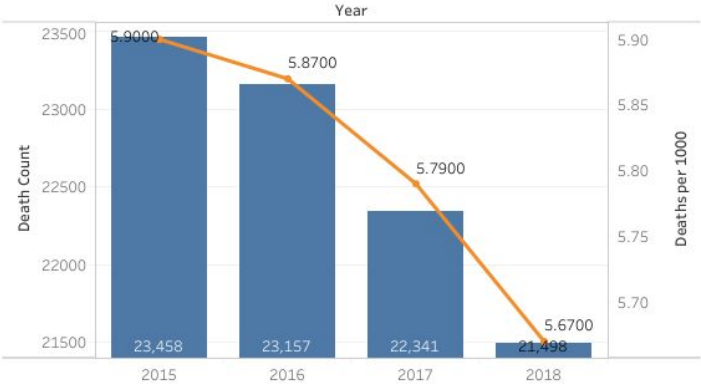
TOP N

6

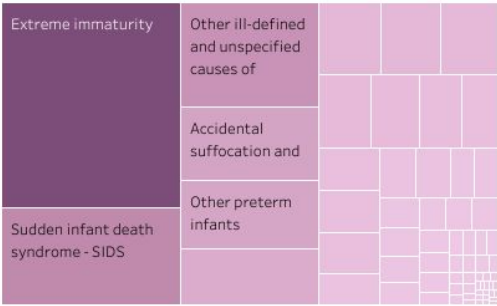
\*\* Drag the slider to  
update N

# Dashboard 2 - Infant Mortality in the US [Interactive dashboard]

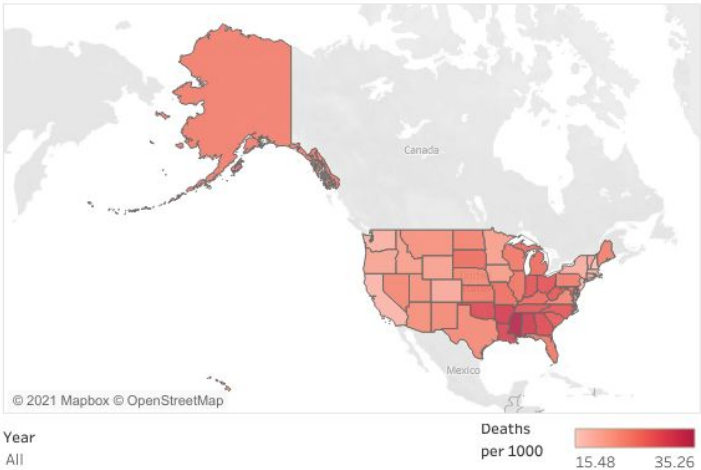
Overall Trend of Infant Deaths by Year



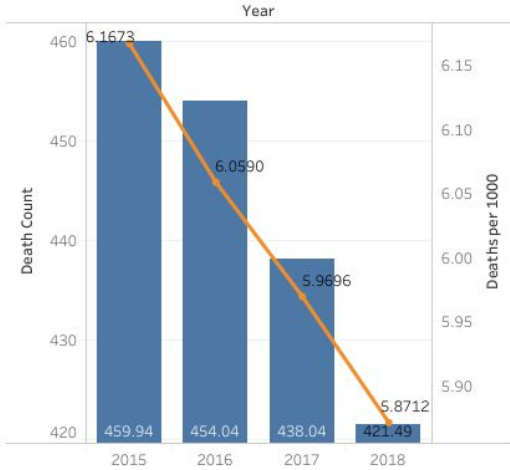
Cause of Infant Deaths



Statewise Infant Deaths per 1000



Infant Deaths Trend by State





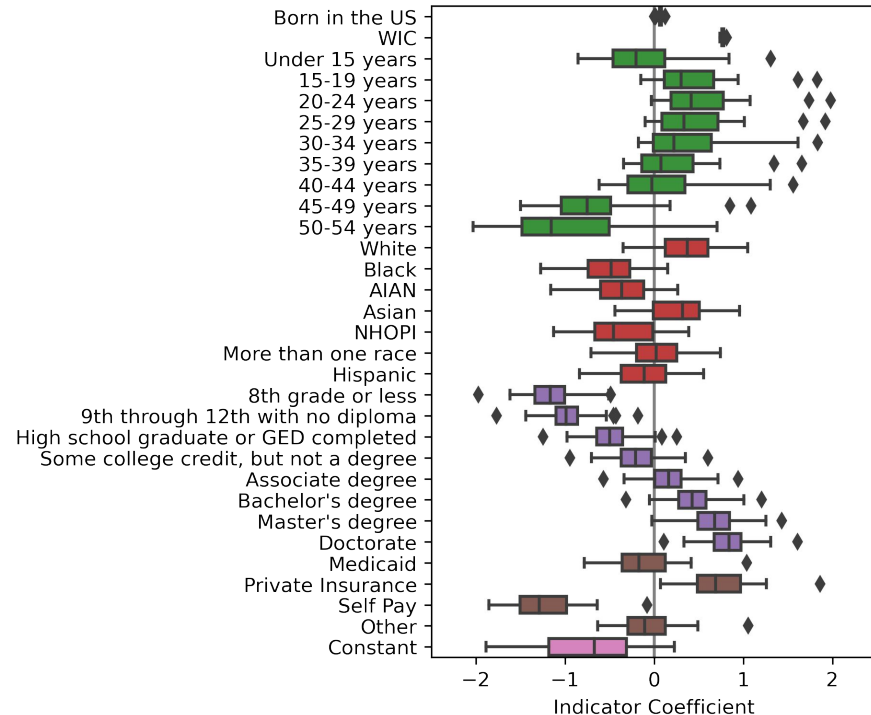
# Statistical Analysis

# Who Receives Prenatal Care?

What factors influence who receives prenatal care?

Logistic regression identified favorable/unfavorable predictors of prenatal care use:

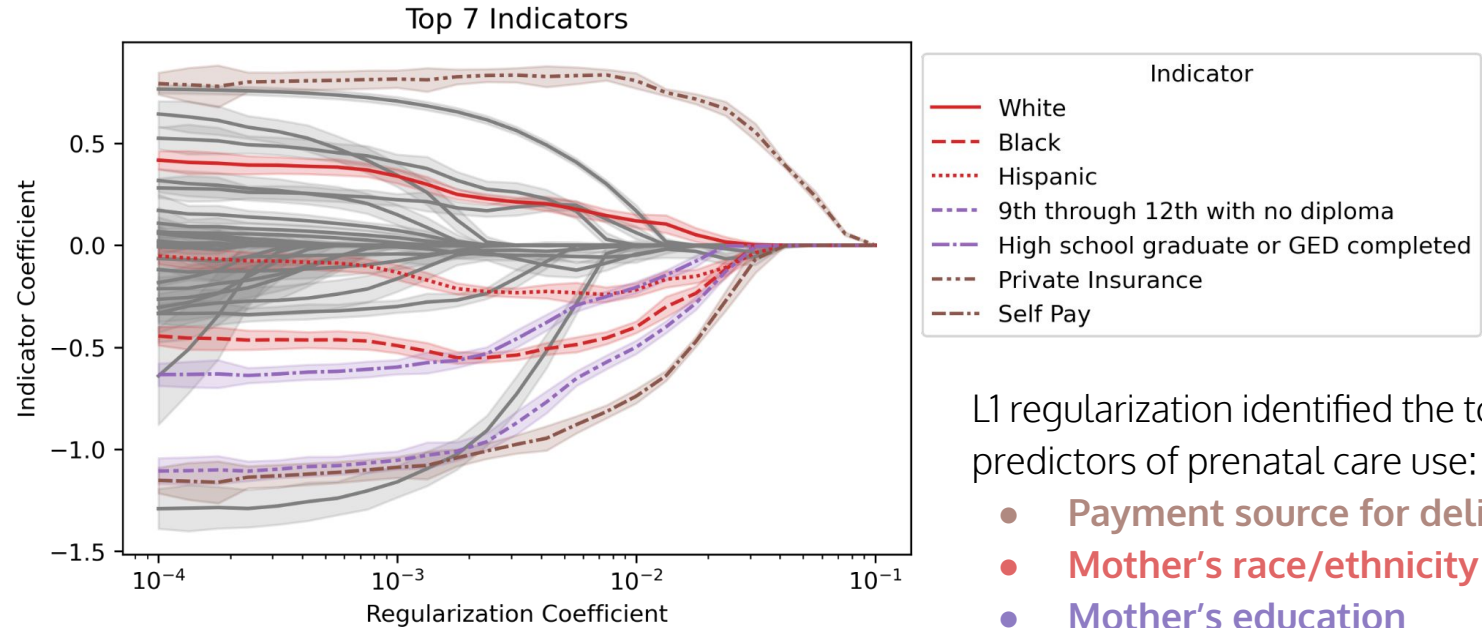
- Greater educational attainment **increases** odds of receiving care
- Private insurance **increases** the odds, while self-pay **decreases** the odds of receiving care





# Who Receives Prenatal Care?

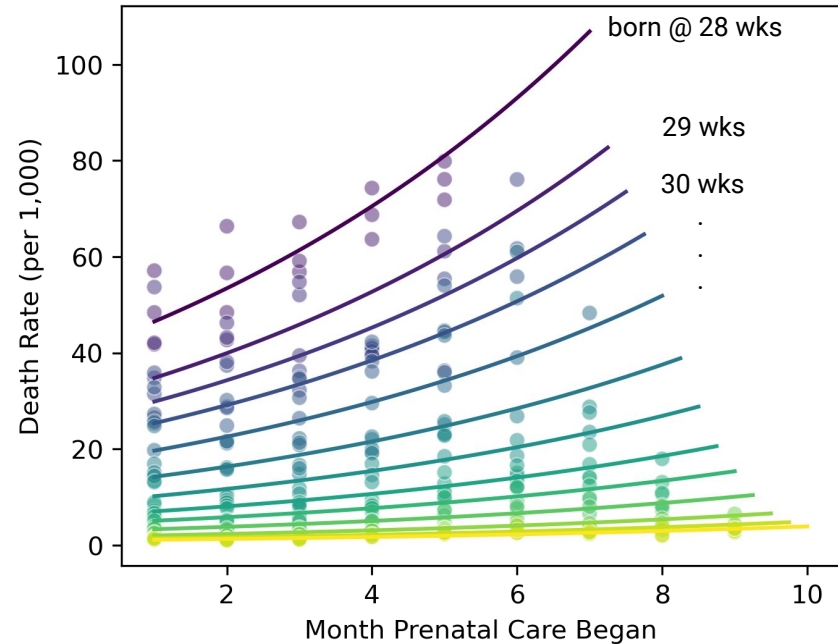
What factors influence who receives prenatal care?



# How does Prenatal Care Affect Infant Outcomes?

Does it matter when prenatal care begins?

Mixed-effects modeling suggested that receiving earlier prenatal care **decreases** the average death rate, with larger differences for babies born at earlier gestational age.

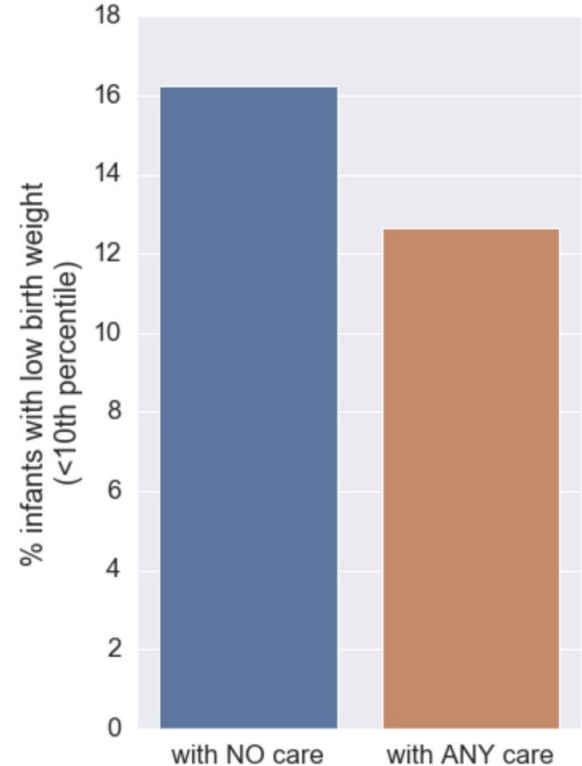
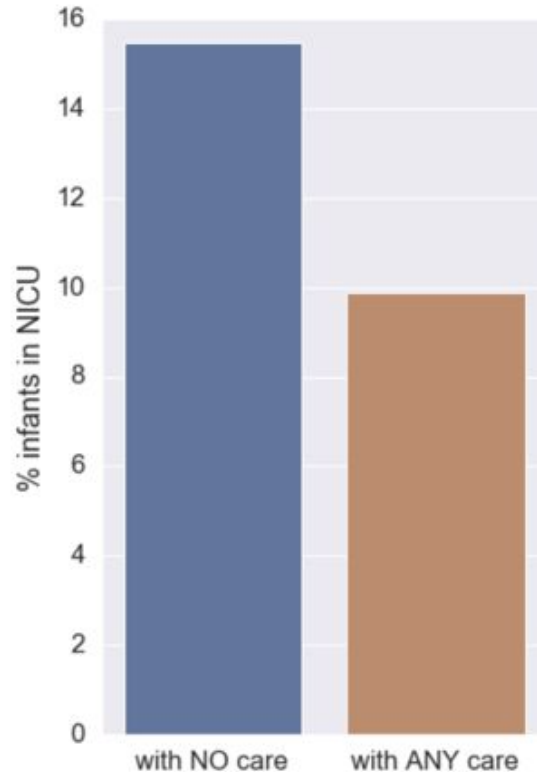


# How does Prenatal Care Affect Infant Outcomes?

## Outcomes of Matching Model:

In 2018, access to prenatal care was associated with

- 36% **reduction** in rate of NICU admissions
- 22% **reduction** in very low birth weight



# Logistic Regression

Estimating the Effect of Prenatal Care on the Odds of an Infant  
Entering the NICU After Birth

## Outcomes of Regression:

- Prenatal care access  
**decreased** odds of NICU  
admission by ~30%

	coef	std err	z	P> z	[0.025	0.975]
Intercept	-2.6059	0.027	-94.922	0.000	-2.660	-2.552
Prenatal care	-0.3546	0.027	-13.228	0.000	-0.407	-0.302
Gestational week	-0.3603	0.002	-234.940	0.000	-0.363	-0.357
Maternal age	0.0596	0.004	15.337	0.000	0.052	0.067
Maternal education	-0.0171	0.003	-5.803	0.000	-0.023	-0.011
Mat. born outside US	0.0357	0.010	3.663	0.000	0.017	0.055
Race/ethnicity: black	0.0640	0.011	5.638	0.000	0.042	0.086
Race/ethnicity: hispanic	0.0424	0.010	4.223	0.000	0.023	0.062
Smoking during pregn.	0.1429	0.018	8.082	0.000	0.108	0.178
Cesarean section	0.7121	0.008	92.769	0.000	0.697	0.727
Payment: medicaid	0.0969	0.010	10.198	0.000	0.078	0.116
Payment: self-pay	-0.1154	0.022	-5.211	0.000	-0.159	-0.072



# Conclusions

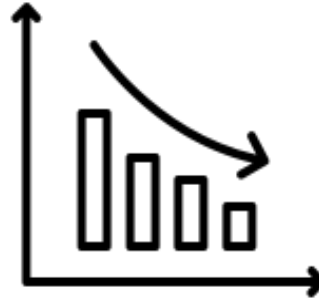
## Conclusions

1)



Use of prenatal care varies by insurance, race, and education

2)



Prenatal care lowers death rate and NICU admission

3)



Earlier prenatal care improves outcomes

# Future Improvements & Next Steps

1. Improve matching and balancing data sets

2. Explore other variable transformations and encodings

3. Include additional features and more sophisticated models

4. Investigate spatial and temporal patterns



Thank you